

AMENDMENTS TO THE CLAIMS

Claims 1-34. (Canceled)

35. (Currently amended): A method for extracting manganese from a ~~multi-component geothermal brine~~ solution, comprising:

(a) contacting the ~~multi-component geothermal brine~~ solution with a QL reagent to create a reaction solution, wherein the QL reagent comprises a quaternary ammonium compound, a hydrogen ion exchange reagent and an organic solvent-~~(QL reagent)~~, and wherein the reaction solution is heated to a temperature in the range of about 180 °F to about 230 °F; and

(b) removing one or more non-manganese impurities from the reaction solution to create an impurity depleted reaction solution; and

(c) extracting manganese from the impurity depleted reaction solution, wherein the pH of the solution remains constant.

36. (Currently Amended): The method of claim 35, wherein the pH of the impurity depleted reaction solution remains above 1.5.

37. (Previously Presented): The method of claim 35, wherein step (b) comprises stripping the reaction solution by contacting the reaction solution with an acid; oxidizing and precipitating one or more of the impurities in the reaction solution; and removing the oxidized and precipitated impurities from the reaction solution to create an impurity depleted reaction solution.

38. (Previously presented): The method of claim 37, wherein the acid comprises a non-oxidizing acid.

39. (Previously presented): The method of claim 37, wherein calcium is extracted from the reaction solution during the stripping step.

40. (Currently amended): The method of claim 35, wherein calcium is extracted from the ~~multi-component geothermal brine~~ solution in a further step comprising: introducing a manganese-rich strip solution to the reaction solution; displacing calcium from the reaction solution; and scrubbing the displaced calcium from the solution.

41. (Previously presented): The method of claim 40, wherein the manganese-rich strip solution contains an organic phase/aqueous phase (O/A) ratio between 5-20.

42. (Canceled)

43. (Currently amended): The method of claim [[42]] 35, wherein the geothermal brine contains zinc which is removed ~~therefrom from the multi-component solution~~ through a step comprising: contacting the ~~geothermal brine multi-component solution~~ with a reagent to create a mixture, wherein the reagent comprises a quaternary ammonium compound and a hydrogen ion exchange reagent; contacting the mixture with pure H₂O; and separating the zinc from the mixture.

44. (Previously presented): The method of claim 35, wherein a phase modifier is contacted with the reaction solution in step (a).

45. (Previously presented): The method of claim 35, wherein the impurity depleted reaction solution comprises manganese chloride.

46. (Previously presented): The method of claim 35, wherein in step (c) the impurity depleted reaction solution is combined with an acid to produce an electrolyte bath.

47. (Previously presented): The method of claim 46, wherein the acid is sulfuric acid or hydrochloric acid.

48. (Canceled)

49. (Currently amended): A method for extracting manganese from a ~~composition containing an impurity~~ geothermal brine composition containing manganese and one or more ~~impurities~~, comprising:

contacting [[a]] the composition containing manganese and one or more impurities with a QL reagent to create a reaction solution, wherein the reaction solution is heated to a temperature in the range of about 180 °F to about 230 °F;

contacting the reaction solution with an acid;

oxidizing and precipitating one or more of the impurities in the reaction solution;

removing the oxidized and precipitated impurities from the reaction solution to create an impurity depleted reaction solution; and

applying an electric current to the impurity depleted reaction solution and removing the manganese therefrom, wherein the pH of the impurity depleted reaction solution remains constant.

50. (Previously presented): The method of claim 49, wherein the QL reagent comprises a quaternary ammonium compound, a hydrogen ion exchange reagent and an organic solvent.

51. (Previously presented): The method of claim 49, wherein the acid is a non-oxidizing acid.

52. (Previously presented): The method of claim 49, wherein all components of step (a) are performed under anoxic conditions.

53-54. (Canceled)

55. (New): A method for extracting manganese from a geothermal brine solution, comprising:

(a) contacting the geothermal brine solution with a quaternary ammonium compound, a hydrogen ion exchange reagent and an organic solvent to form a reaction solution comprising an aqueous phase and an organic phase, wherein the reaction solution is heated at a temperature in the range of about 180 °F to about 230 °F; and

(b) extracting manganese from the aqueous phase into the organic phase to form a manganese-containing organic phase, wherein the pH of the reaction solution remains constant in the range of about 2 to about 4; and

(c) stripping the manganese-containing organic phase by contacting the manganese-containing organic phase with a non-oxidizing aqueous acid to form a manganese-containing aqueous solution; oxidizing, precipitating, and removing one or more of the impurities from the manganese-containing aqueous solution to create an impurity depleted reaction solution.

56. (New): The method of claim 55, wherein calcium is extracted from the geothermal brine solution in a further step comprising: introducing a manganese-rich strip solution to the manganese-containing organic phase and displacing calcium from the organic phase.

57. (New): The method of claim 56, wherein the manganese-rich strip solution contains an organic phase/aqueous phase ratio between about 5 and 20.

58. (New): The method of claim 55, wherein the geothermal brine solution contains zinc which is removed therefrom through a step comprising: contacting the geothermal brine with a reagent to create a mixture, wherein the reagent comprises a quaternary ammonium compound and a hydrogen ion exchange reagent; contacting the mixture with pure H₂O; and separating the zinc from the mixture.

59. (New): The method of claim 55, wherein a phase modifier is contacted with the reaction solution in step (a).

60. (New): The method of claim 55, wherein the manganese-containing organic phase comprises manganese chloride.

61. (New): The method of claim 56, wherein the non-oxidizing aqueous acid is sulfuric acid or hydrochloric acid.

62. (New): The method according to claim 55, further comprising: applying an electric current to the impurity depleted reaction solution and removing the manganese therefrom.